



Floral biology studies in different seedling progenies of karonda (*Carissa carandas*)

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Abstract: Karonda (*Carissa carandas* L.) is important dry land fruit crop exceedingly hardy shrub generally found in forest. The genus *Carissa* to which Karonda belongs includes 32 species out of which only eight are originated from India and according to Cooke (1904) *Carissa* is more useful amongst all. The existing population of this crop shows the variability in floral characters due to heterozygosity (Bhagwat, 1984; Joshi *et al.* 1986) and this offers great scope for crop improvement for this crop. The normally growing 15 progenies selected from Kittur Rani Channamma College of Horticulture, Arabhavi (University of Horticulture Sciences, Bagalkot), Gokak taluk of Belgaum district, during 2011-2012. In the present investigation, the studies were taken with objectives to floral biology studies on seedling progenies of Karonda (*Carissa carandas*) which will helpful for further crop improvement in Karonda. The progeny ARB-4 was recorded the minimum days taken for bud initiation to flowering (15.77 days) and maximum number of sepals (5.17), stamens (5.13). The maximum style and stigma length (12.70 mm and 4.83 mm respectively) was observed in ARB-6. The maximum per cent anthesis was observed at 5.00 am which was ranged from 45.33 to 58.67. The maximum per cent pollen viability and germination (95.75 and 24.67% respectively) was noticed in ARB-4 and maximum pollen germination was observed in 5% of sucrose solution with 48 hours of incubation period at 28.5°C temperature on the basis this study were conducted.

Key words: Karonda, *Carissa carandas*, Pollen viability, Pollen germination

Introduction

Karonda (*Carissa carandas* L.) is also known as karamarda, karamcha, kalakkay, avighna and karekayi in India. It is called as 'Kavalikai' in Kannada. It belongs to family Apocynaceae and originated in India and its chromosome number is $2n = 22$. It occurs throughout India, Myanmar, Sri Lanka, South Africa and Malaya, mostly on sandy or rocky soil in a wild state. In India, it can be cultivated on wide range of soils and has immense potential for commercial planting. Owing to its hardy nature and varied utility, it can be included under wasteland cultivation. It occurs naturally in Bihar, West Bengal and southern India and is widely planted as a protective hedge throughout the country Anonymous (2009) and Anonymous (2010). Flowers of karonda are white, fragrant, tubular, regular, bisexual, complete and epigynous, solitary, or in cymose clusters. Sepals 4-6, green in colour almost free to the base, imbricate, persistent and ovate in shape. Petals are as many as sepals, lobes contorted in bud; the corolla often has hairy or scaly appendages or outgrowth of various kinds. Stamen as many as petals and alternate with them in one whorl, filaments short, anthers yellow and inserted on the corolla tube interpose, arrow shaped, often free or united in a cone. Style long, simple, stigma thickened two lobed, yellow coloured and hairy below. Carpels usually 2, very rarely more than 2, united (connate) or united by styles or stigmas only, but free at ovary. Ovary superior 2 celled Karale *et al.* (1990). Although the variation was observed in floral biology as well to knowing the pollen germination and pollen viability is very important for crossing and releasing the varieties. Therefore, the objective was conducted on floral biology studies in different seedling progenies of Karonda (*Carissa carandas*).

Materials and Methods

The present investigation on floral biology studies in different seedling progenies of karonda (*Carissa carandas*) was carried out at Kittur Rani Channamma College of Horticulture, Arabhavi during 2011-2012. The materials used, techniques adopted and observation recorded during the course of the investigations are furnished in this chapter. Study analysed with complete randomised block design, 15 treatments and 3 replications (progenies) were collected on the basis of floral biology parameters seedling progenies of karonda, viz., per cent anthesis, pollen viability, days taken from bud initiation to flowering, number of sepals, number of petals and number of stamens were counted by dissecting the flowers into different parts, style length and stigma length was measured by using the digital vernier callipers and expressed in millimeters (mm) and per cent pollen germination were recorded in 5 per cent sucrose solution. These slides were kept in incubator, where the required temperature was maintained. Observation for pollen germination was recorded by using microscope at 28.5 °C (ambient temperature) after a period of 12, 24 and 48 hours were recorded in different seedling progenies of karonda similar findings were Caraballo (2001) in Guava. The studies were taken with objectives to study the association between floral biology for further crop improvement in karonda.

Results and Discussion

It is apparent from the (Table-1) that the percent anthesis took place during flowering season (January- February). The data revealed that, irrespective of karonda progenies maximum per cent anthesis was observed at 5.00 am and ARB-4 (58.67%) which was on par with ARB-3 (53.67%) and minimum per cent anthesis was in ARB-11 (45.33%). During 6.00 am, significantly maximum

observed in ARB-11 (23.33%) followed by ARB-4 (22.67%) and ARB-1, ARB-15 (22.00%) which were on par with each other. The time of anthesis of flowers in the present study revealed that the maximum per cent anthesis was observed at 5.00 am which was ranged from 45.33 to 58.67 per cent followed by 6.00 am, 4.00 am, 7.00 am, 8.00 and least per cent anthesis was observed in 9.00 am.

Table-2 data revealed that, irrespective of karonda progenies maximum pollen viability. However at the time of anthesis, ARB-4 (95.75%) recorded maximum pollen viability, followed by ARB-3 (95.50%), ARB-6, ARB-8 and ARB-12 (95.00%), ARB-2 (94.50%) and ARB-15 (94.25%) which were on par with each other. During 12 hours before anthesis significantly maximum pollen viability was observed in ARB-4 (90.67%) followed by ARB-15 (88.00%) and ARB-2 (87.67%) which was on par with each other. All the progenies recorded high pollen viability which ranged from 91.00 to 95.75 per cent. The highest pollen viability was noticed when flowers were collected at the time of anthesis followed by 12 hours before anthesis, 12 hours after anthesis and 24 hours after anthesis.

Significantly minimum days taken from bud initiation to flowering was observed in ARB-4 (15.77) followed by ARB-1 (16.40), ARB-7 (16.43), ARB-9 (16.47), ARB-11 (16.50), ARB-8 and ARB-10 (16.57) and ARB-6 (16.60) which were on par with each other and maximum days taken from bud initiation to flowering was noticed in ARB-2 (18.58). The number of sepals, petals and stamens of present investigation indicated that, the maximum number of sepals, petals and stamens was observed in ARB-4 (5.17), (5.20) and (5.13) followed by ARB-3 (5.07 sepals), ARB-3 (5.13 petals) and ARB-8, ARB-11, ARB-13, ARB-14 and ARB-15 (5.00) which were on par with ARB-4 (5.13 stamens). While maximum style length and stigma length was noticed in ARB-6 (12.70 mm) which was on par with ARB-15 (12.50 mm) and (4.83 mm) followed by ARB-1 (4.50 mm), ARB-10 (4.47 mm) and ARB-2 (4.33 mm) which were on par with each other (Table-3).

The maximum pollen germination was observed in 5% of sucrose solution with 48 hours of incubation period at 28.5°C temperature. Maximum pollen germination was observed in ARB-4 (24.67%) and minimum pollen germination was observed in ARB-11 (12.00%) at 12 hours of incubation period. Maximum pollen germination was observed in ARB-4 (46.67%) and minimum pollen germination was observed in ARB-10 (27.00%) at 24 hours of incubation period, while maximum pollen germination in ARB-6 (83.67%) and minimum pollen germination in ARB-9 (56.33%) at 48 hours of incubation period, respectively. The lowest pollen germination was recorded in 12 hours of incubation period compared to 24 and 48 hours of incubation period.

Per cent anthesis at different hours of the day in seedling progenies of karonda (Table 1) percent anthesis took place during flowering season (January- February) irrespective of karonda progenies maximum per cent anthesis was observed at 5.00 am and ARB-4 This might be due to dominant influence of agro-climate on opening of flowers rather than crop specificity. Sundararajan (1960), Minhas and Sandhu (1985), Lenka *et al.* (1996) also made similar observation in sapota.

Table-1: Per cent anthesis at different hours of the day in seedling progenies of karonda

Progenies	Per cent anthesis					
	4.00 am	5.00 am	6.00 am	7.00 am	8.00 am	9.00 am
ARB-1	9.67	51.00	22.00	8.33	3.67	1.83
ARB-2	9.00	51.67	21.00	8.67	4.00	1.83
ARB-3	8.33	53.67	19.00	7.67	3.67	1.67
ARB-4	10.67	58.67	22.67	8.33	4.33	1.17
ARB-5	8.00	49.00	21.00	7.67	4.67	2.00
ARB-6	8.67	50.00	20.33	8.33	5.00	1.67
ARB-7	8.33	49.00	20.33	8.33	4.67	1.83
ARB-8	8.00	50.33	21.00	9.00	5.00	2.33
ARB-9	7.33	49.00	20.33	9.00	5.67	1.67
ARB-10	8.67	47.00	19.33	9.00	4.33	1.67
ARB-11	8.00	45.33	23.33	9.00	4.67	1.17
ARB-12	7.67	48.00	18.00	10.33	5.00	1.83
ARB-13	9.00	46.00	18.00	9.33	5.00	2.17
ARB-14	9.00	50.67	19.00	8.67	5.67	2.17
ARB-15	10.33	53.33	22.00	9.67	3.33	1.33
S.Em±	0.52	1.73	0.73	0.40	0.25	0.15
C.D @ 5%	1.52	5.00	2.11	1.15	0.71	0.43

Table-2: Per cent pollen viability of seedling progenies of karonda

Progenies	Pollen viability (%)			
	12 hours before anthesis	At the time of anthesis	12 hours after anthesis	24 hours after anthesis
ARB-1	84.67	93.00	80.33	11.67
ARB-2	87.67	94.50	77.33	11.67
ARB-3	85.67	95.50	84.00	13.33
ARB-4	90.67	95.75	86.00	15.00
ARB-5	83.00	93.50	81.00	13.00
ARB-6	83.33	95.00	81.67	12.67
ARB-7	79.67	93.50	80.00	9.67
ARB-8	81.00	95.00	79.00	9.00
ARB-9	79.33	93.00	78.00	7.67
ARB-10	78.33	92.50	79.33	9.33
ARB-11	83.00	92.50	80.67	10.33
ARB-12	84.67	95.00	78.00	10.00
ARB-13	84.00	93.50	81.00	11.33
ARB-14	80.33	91.00	82.33	11.67
ARB-15	88.00	94.25	85.00	12.33
S.Em±	1.25	0.71	1.15	0.65
C.D @ 5%	3.63	2.07	3.34	1.88

Table-2 data revealed that, irrespective of karonda progenies maximum pollen viability at 12 hours before anthesis, at the time of anthesis, 12 hours after anthesis and 24 hours after anthesis found in ARB-4 this might be due to genetic variability of seedling of karonda and also dominant influence of agro-climate on opening of flowers rather than crop specificity a. Similar findings were noted by (Nalawadi *et al.* (1977), Minhas and Sandhu (1985) and Lenka *et al.* (1996) in sapota.

Floral characteristics of seedling progenies of karonda studied and presented in (Table 3) significantly different floral characters found in ARB-4, ARB-6 and ARB-15 this might be due to genetic make-up of karonda progenies (Table-3). Karale *et al.*

Table-3: Floral characteristics of seedling progenies of karonda

Progenies	Days taken from Bud initiation to flowering	No. of sepals	No. of petals	No. of stamens	Style length (mm)	Length of stigma (mm)
ARB-1	16.40	5.03	5.03	4.93	11.87	4.50
ARB-2	18.58	5.03	5.03	4.83	11.33	4.33
ARB-3	16.90	5.07	5.13	4.87	10.83	4.07
ARB-4	15.77	5.17	5.20	5.13	10.67	4.13
ARB-5	16.93	5.03	5.03	4.87	11.13	4.30
ARB-6	16.60	4.97	4.97	4.93	12.70	4.83
ARB-7	16.43	5.03	5.03	4.87	10.83	4.27
ARB-8	16.57	5.03	5.03	5.00	10.33	4.30
ARB-9	16.47	5.03	5.00	4.93	10.80	4.13
ARB-10	16.57	5.00	5.00	4.93	11.43	4.47
ARB-11	16.50	5.00	5.03	5.00	11.07	4.10
ARB-12	16.77	5.00	5.00	4.87	11.67	4.00
ARB-13	16.77	5.03	5.03	5.00	9.87	4.17
ARB-14	16.80	5.00	5.00	5.00	11.58	4.23
ARB-15	16.90	5.07	5.07	5.00	12.50	4.13
S.Em±	0.29	0.03	0.03	0.06	0.24	0.07
C.D @5%	0.85	0.08	0.08	0.16	0.68	0.19

(1990) also noticed variation in flower characteristics, fruit setting and mode of pollination was studied in 10 umbels on each of 12 shrubs and distinct variation in the average of floral buds (14.6 to 22.6) per umbel, length of flower bud (1.42 to 2.15 cm), petal number (4 to 6), flower groups *i.e.* umbel segments (1 to 6 in number) and white to cream white colour with pink strips on the petals was observed. A majority of umbel had 3 to 4 segments but shrub No. 2 had all the umbels with maximum segments (6 in number) The existence of variations in floral biology characters has been reported by several workers in several fruit crops like Nalawadi *et al.* (1977), Minhas and Sandhu (1985), studied characters like number of sepals, petals and stamens in sapota. Lenka *et al.* (1996) observed that the style length among the cultivars of sapota.

Pollen germination (%) at ambient temperature condition of seedling progenies of karonda presented in (Table 4) the maximum pollen germination was observed in 5% of sucrose solution with 48 hours of incubation period at 28.5°C temperature and maximum pollen germination was observed in ARB-4 and minimum pollen germination in ARB-9. This might be due to number of hours increases the pollen germination also more and dominant influence of agro-climate on flowers rather than crop specificity presented in (Table 4). Earlier workers have also reported similar variations in these characters [Kumar *et al.* (1977) in custard apple, Nalawadi *et al.* (1977) in sapota].

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Table- 4: Pollen germination (%) at ambient temperature condition of seedling progenies of karonda

Progenies	Pollen germination at ambient temperature after sucrose treatment		
	12 Hours	24 Hours	48 Hours
ARB-1	16.67	33.33	69.33
ARB-2	20.00	40.67	67.67
ARB-3	22.00	45.00	72.67
ARB-4	24.67	46.67	82.67
ARB-5	16.67	42.33	74.67
ARB-6	20.33	45.33	83.67
ARB-7	18.00	40.67	62.33
ARB-8	13.00	38.33	64.00
ARB-9	12.33	38.67	56.33
ARB-10	13.67	27.00	58.67
ARB-11	12.00	28.67	67.33
ARB-12	14.67	27.33	72.00
ARB-13	19.67	35.67	73.67
ARB-14	19.33	41.67	74.33
ARB-15	22.33	46.00	79.33
S.Em±	0.67	1.17	1.54
C.D @ 5%	1.95	3.39	4.47

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